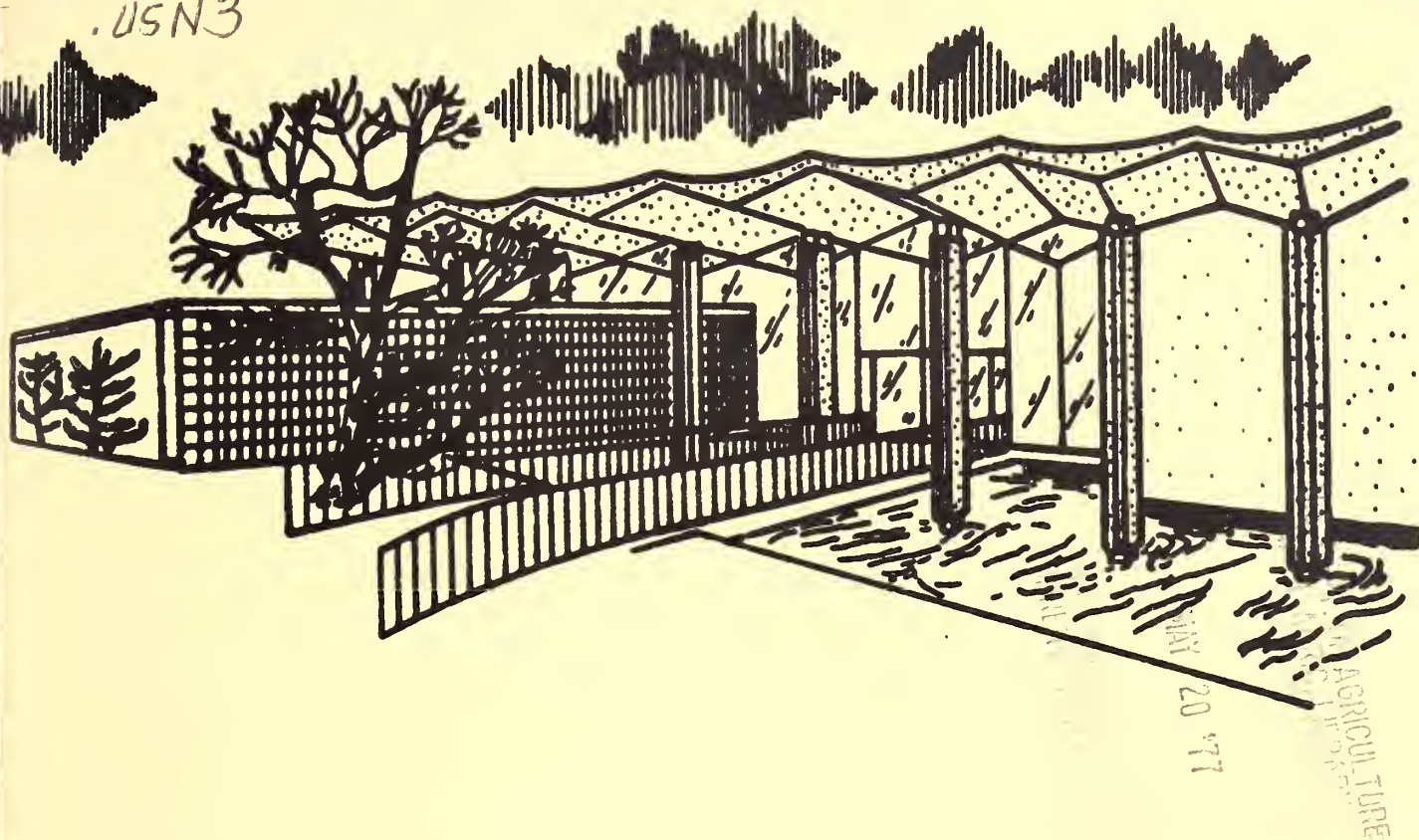


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U.S. NATIONAL ARBORETUM

ANNUAL REPORT

1975-76

**AGRICULTURAL RESEARCH SERVICE
U.S. DEPARTMENT OF AGRICULTURE
WASHINGTON, D. C.**



U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
U.S. NATIONAL ARBORETUM

DIRECTOR'S OFFICE

John L. Creech, Ph.D.; Director
Doris M. Thibodo; Secretary to the Director
Nancy M. Cronin; Budget and Personnel

FACILITIES AND MAINTENANCE

M. W. Scarborough; Manager
Thurman J. Dade; Maintenance Supervisor
Margaret E. Brady; Procurement

EDUCATION, INFORMATION AND LIBRARY

Erik A. Neumann, M.S.; Horticulturist, Curator of Education
Mary Ann Jarvis; Education Assistant
Jayne MacLean, M.S.; Librarian

PLANT COLLECTIONS AND PLANT EXCHANGE

Sylvester G. March; Horticulturist
Judith L. Shirley, M.S.; Plant Propagator
Loring I. Benedict, B.S.; Greenhouse and Gardens
Robert F. Drechsler, B.S.; Curator, Bonsai Collection
Robert F. Doren, B.S.; Curator, Gotelli Conifer Collection
William R. Waldron, B.S.; Curator, Azalea-Rhododendron Collection
Ernest J. Luskey; Curator, Camellia Collection
Craig T. Keys; Gardener-in-Charge, Fern Valley
James A. Rogers; Gardener-in-Charge, Dogwood Collection
Clarence L. Henderson; Gardener-in-Charge, Boxwood-Daylily Collection
Robert Woodard; Gardener-in-Charge, Administration Building Gardens
Junior A. Peterson; Maintenance Gardener
Moses J. Bishop; Plant Labeling and Signs

ARBORETUM RESEARCH

Nomenclature and Taxonomy of Cultivated Plants

Frederick G. Meyer, Ph.D.; Taxonomist, Curator, Arboretum Herbarium
Theodore R. Dudley, Ph.D.; Taxonomist, Curator of Type Collections
Roland M. Jefferson, B.S.; Botanist
Peter M. Mazzeo, B.S.; Botanist
James McClammer, B.S.; Herbarium Assistant

Cytogenetics, Breeding and Evaluation of Shade Trees

Frank S. Santamour, Jr., Ph.D.; Research Geneticist
Robert L. Pryor, B.S.; Horticulturist
Gene K. Eisenbeiss, B.S.; Horticulturist
Harold E. Vettel, B.S.; Chemist

ARBORETUM RESEARCH

Cytogenetics, Breeding and Evaluation of Ornamental Shrubs

Donald R. Egolf, Ph.D.; Research Geneticist

Anne O. Andrick; Research Technician

Ornamental Introduction, Evaluation and Development

William L. Ackerman, Ph.D.; Research Horticulturist

Margot Williams, M.S.; Horticulturist

Plant Introduction Station, Glenn Dale, Maryland

Howard E. Waterworth, Ph.D.; Virologist

COOPERATIVE SERVICES

National Capital Area Federation of Garden Clubs, Inc.

Mrs. John J. Moosberger; President

Mrs. Robert J. Westbrook; Federation Hdqtrs. and Garden Center

Mrs. Judson B. French; Chairman, Guide Service

Mrs. Charles Vandover; Information and Activity Center

Friends of the National Arboretum

Frank P. Cullinan, Ph.D.; Trustee

Mrs. Benjamin A. Powell; Trustee

Henry T. Skinner, Ph.D.; Trustee

Arboretum Collaborator

Henry T. Skinner, Ph.D.

NATIONAL ARBORETUM ADVISORY COUNCIL
July 1976 - July 1978

Mr. William Flemer, III, Chairman
Princeton, New Jersey

Dr. John P. Mahlstedt, Vice Chairman
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Dr. H. O. Graumann, Executive Secretary
U.S. Department of Agriculture

Mr. Carl W. Buchheister
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Mr. Alfred S. Martin
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Mr. R. Henry Norweb, Jr.
Mentor, Ohio

Mrs. Benjamin A. Powell
Chevy Chase, Maryland

Mrs. Edward W. C. Russell
Washington, D.C.

Mr. Hideo Sasaki
Watertown, Massachusetts

Dr. Richard P. White
Silver Spring, Maryland

Dr. Fred B. Widmoyer
Las Cruces, New Mexico

Mr. John B. Wight, Jr.
Cairo, Georgia

REPORT OF THE U.S. NATIONAL ARBORETUM
for the period September 1975-December 1976

prepared for the meeting of the
Advisory Council
April 18-19, 1977

ARBORETUM ADMINISTRATION

A. Budget and Operations

The FY 1976 Operating Plan Budget was \$1,171,000 for salary and support services. During the year, the initial budget was increased by \$173,700 to cover mandatory salary increases, extra personnel in conjunction with the Bicentennial Year, and replacement of antiquated equipment.

A special funding from ARS and NER reserves of \$210,000 was provided for construction of the Bonsai Pavilion.

With the shift of the fiscal year from July-June to October-September, effective October 1, 1976, a Temporary Quarter (July-September) was established to fill the time gap and \$415,210 was allotted for this period.

In addition, the Congress culminated a two-year effort with approval of a supplemental appropriation of \$5,985,000 for purchase and preliminary rehabilitation of the 33-acre brickyard property adjoining the National Arboretum. This significant piece of legislation furnishes the Arboretum with a unique opportunity to provide for a major entrance, visitor service facilities, and a research/education center that will markedly enhance our entire public service program.

In FY 1977 (commencing October 1, 1976), at the request of the Agricultural Research Service, Congress increased the Arboretum's permanent base by \$170,400. The initial budget for FY 1977 was \$1,505,900. In addition, the Deputy Administrator for the Northeastern Region provided a special funding of \$25,000 for repair and maintenance. Additionally, from ARS and NER reserve, \$70,000 has been allocated for a National Arboretum Master Plan. This plan is required by the NCPC as a prelude to any expansion of the National Arboretum facilities.

The activities undertaken during this reporting period were a remarkable advent to the Arboretum's second 50 years (March 4, 1977). In consequence of the authority to acquire the "brickyard", the Director appeared before the National Capital Planning Commission and presented a detailed developmental plan in support of revised

boundaries and expanded public service facilities. This submission was prepared cooperatively by the National Arboretum, the Regional Engineering Office, and the Departmental Office of Operations. The proposed use of the brickyard was approved by the NCPC at their meeting on August 12, 1976.

This approval included the construction of a temporary entrance road through the brickyard, chain-link fencing, and certain earth-moving activities to eliminate the unsightly clay mounds remaining from brickmaking activities. It restricted, however, our activities in the immediate area of the brickmaking facilities until such time as an historic evaluation of the kilns and accessory structures has been made. As a consequence, all buildings have been sealed for safety purposes. Plans for the temporary road access were approved by the District of Columbia Highway Department and the NCPC. When the temporary road is opened in April 1977, the Highway Department will have new directional signs in place directing visitors to the new entrance. This temporary road fulfills our immediate obligation to the residents living on "R" Street. This street has served as the main entrance to the Arboretum for many years, and the traffic level on "R" Street had reached unbearable proportions.

B. Friends of the National Arboretum

As a result of Congressional action, the National Arboretum Act of March 4, 1927, was amended to authorize the Secretary of Agriculture to accept and administer on behalf of the United States gifts or devises of real and personal property for the benefit of the National Arboretum. The Secretary has redelegated the authority to the Administrator, ARS. This new authority was immediately used by ARS in conjunction with an agreement with the Herb Society of America to develop a National Herb Garden at the Arboretum. The Herb Society is in process of raising \$400,000 as their contribution to construction of the garden.

Under the National Arboretum Gift Act, \$18,340.10 was received from Mrs. Randolph A. Kidder to construct a sitting area and overlook in Cryptomeria Valley. This will provide a peaceful site for visitors to view the camellias and enjoy the vista to the Anacostia River.

Among the major contributions to the Friends of the Arboretum was a contribution of \$15,000 to conduct plant explorations in Japan. Dr. Creech and Mr. March traveled in Japan from October 10 to December 1, 1976. The cost of this first exploration was \$10,741.36. The balance of the funds will be used for a follow-up trip for one month (March 15-April 15, 1977) for Mr. Robert Drechsler, Curator of the National Bonsai Collection.

Total contributions for the period September 16, 1975, through March 15, 1977, amounted to \$25,506.15. Expenditures for this period were \$32,761.94.

C. Business Operations

Personnel. The personnel strength for the Arboretum has increased from 75 to 83 positions by the addition of 1 horticulturist, 4 research technicians, 1 guard, 1 maintenance worker, and 1 laborer. These are all part-time positions.

In 1976, the National Arboretum was selected as a Youth Conservation Corps camp. Ten youths from Metropolitan Washington were employed during the summer under a technical leader. This program is sponsored by the U.S. Forest Service.

Training. During the reporting year, 51 arboretum employees took formalized training, ranging from seminars to college level courses aimed at improving work skills.

Outside Awards. Congratulations are in order to employees receiving outside awards. Dr. Donald R. Egolf received the Silver Seal of the National Council of State Garden Clubs, a Certificate for Distinguished Research in Horticulture from the National Capital Area Federation of Garden Clubs, and the National Award for Public Service in Horticulture--Monroe County (Rochester) New York.

Mr. Peter Mazzeo shared in the 1976 J. Shelton Horseley Research Award from the Virginia Academy of Science for research leading to the re-discovery of the reportedly extinct Betula uber.

Dr. John L. Creech received service plaques from the Bonsai Clubs International and the Potomac Bonsai Society for the National Bonsai Collection.

Ms. Mary Ann Jarvis received a Life Membership in the National Capital Area Federation of Garden Clubs for her service to horticultural activities.

D. Facilities

There have been a number of improvements in Arboretum facilities. Following are some of the major items.

1. Replacement of the roofing on the headhouse, all maintenance-yard buildings, and the "M" Street Guard house. This completes all buildings in the Arboretum needing roof repairs-----\$34,267
2. Razing of the old greenhouse range has begun. All houses have been dismantled and carried away by Melwood School for salvage. The remaining buildings will be destroyed by the Arboretum and the area filled in. No cost.
3. Contracts have been released on new electric and gas lines and heating system for all of the plastic greenhouse range-----\$35,900

4. Contract on replacement of electrical lines and thermostats in the glass greenhouse range-----\$ 2,538
5. New steam pipes in Dr. Egolf's greenhouse-----\$ 4,457
6. Installed irrigation system for plastic greenhouses-----\$ 3,817
7. Installed new 10,000 gallon oil tank for Administration building including change-over from #5 fuel oil to #2 which will give a cleaner system-----\$12,290
8. Electrical work completed in greenhouse-headhouse-----\$ 3,909
9. Re-caulking of walks around Administration building-----\$ 1,500

Vehicles and Heavy Equipment

The Arboretum has acquired three trucks (good condition), one International TD-6 bulldozer (practically new), and one #12 Caterpillar grader (good condition) from excess property at no cost.

The following equipment has been purchased by the Arboretum:

--Pick-up truck, 3/4 T-----	\$ 4,000
--Van, 3/4 T-----	4,800
--Stakebody dump truck, 1-1/2 T-----	8,000
--Vermeer M-50 tractor with large tree spade and ball loader with ditching attachment-----	38,523
--Woodchuck brush chipper, 16-inch-----	5,107
--Vermeer log-splitter-----	2,050
--Yazoo mowers (2), 24-inch-----	531
--Sprayers (5), various types-----	600
--Walkie-Talkie radios (5)-----	3,052
--Hustler mowers (2), slanted, 72-inch-----	7,000
--Hustler hillsider mower, 72-inch-----	8,657
--Repaired (like new) Bobcat skid loader-----	2,300
--New directional signs for Arboretum-----	1,200

Brickyard Property

1. Contract issued for rehabilitation of 33-acre brickyard property, including relocation of approximately 40,000 cubic yards of dirt, ripping and cleaning Hickey Run Creek, construction of new entrance road, enclosing old brickyard buildings for safety-----\$302,663
2. Enclosing the 33-acre brickyard perimeter with chain-link fencing, including entrance gate-----\$ 18,957
3. Fabrication of 378 panels of wrought-iron fence to continue fence along New York Avenue when Master Plan is completed. (Panels are stored in Arboretum maintenance yard.)-----\$ 28,308

Bonsai Facility

The construction of the Bonsai facility was initiated with a Small Business Administration contractor for \$210,000. Arboretum personnel did all the excavation work and construction of the major garden, along with the planting of 23 Cryptomeria japonica 'Yoshino' trees donated by Greenbrier Farms Nursery, Chesapeake, Virginia, valued at \$10,000. The general landscaping and sodding of the area around the facility were also accomplished by Arboretum personnel. A security system was installed for the Bonsai garden by Photo Scan, Inc., at a total cost of \$6,250.

Garden Club of America

Rehabilitation of the Garden Club of America consisted of replacing most of the pathways with concrete and gravel, replacing stone walls, and replacing all cross-tie edging and drainage system.

Cryptomeria Valley

A contract was initiated for filling the swale area in Cryptomeria Valley with approximately 3,000 cubic yards of clay and soil, and construction of a stone water course down through the valley at a cost of \$22,435 from private funds. Also, a contract is ready to be issued for approximately \$20,000 of private funds for the landscaping and construction of an overlook mid-way of the water course.

Security

The Arboretum Guard force has been increased from three to five guards, and it is hoped that we will be able to have as many as eight, eventually. A radio telephone has been installed in the main guard vehicle which gives guards direct communication with the Police Department. On February 28, the Arboretum was authorized to designate uniformed guards as United States Policemen. Inherent with this delegation is the authority to carry firearms by uniformed officers after successful completion of the Comprehensive Basic Guard Training Course approved by General Services Administration. Arboretum guards are being armed because of recent incidents involving safety of property and personnel. In one instance our Activity Center was broken into by a deranged person who set fire in the house. Repairs to the Center amounted to approximately \$1,625 for repainting, replacing locks on outside doors, new refrigerator, and stove. In another case, a bonsai plant was stolen and later returned.

Plants for Future Landscaping

The Agricultural Research Service, Fort Dietrick, Maryland, has given us numerous nice specimen trees--dogwood, Norway spruce, bald cypress, Scotch pine, and several shade tree-types. We are now in the process of moving this material for landscaping the brickyard area and for use around the new National Herb Garden.

Safety

An intensive effort is underway to improve the working conditions for employees and the safety of visitors. Adequate first-aid facilities are available and numerous minor but dangerous hazards have been eliminated. There have been no serious accidents at the Arboretum during the reporting period.

Projected Expansion

Brickyard. The immediate work relates to the simple rehabilitation of the newly acquired property. This includes chain-link fencing of the property, securing the buildings as a safety precaution, construction of a temporary entrance road in expectation that traffic will be shifted from congested "R" Street. That street will be restricted to an administrative entrance. The contracting announcement for developing a Master Plan for the Arboretum was released. This plan is intended to establish developmental concepts for the next decades and set into motion a plan to acquire funds under the Gift Act to construct a Research/Education Center.

Herb Garden. One of the most exciting developments to be undertaken is the National Herb Garden with funds being contributed by the Herb Society of America. That Society's leaders met with the Arboretum staff and approved the concept for the Herb Garden developed by Sasaki Associates, Inc., for the Herb Society. When this garden is completed, the Arboretum will have a unique garden relating to man's use of plant constituents both in a natural and derived manner. This garden, for the first time, provides the Arboretum with an economic plant activity of national interest. It is a forerunner of our goal of showing the public the origins and development of American crop agriculture. The Herb Society contemplates collecting contributions totaling \$400,000. The Arboretum will provide a garden curator and necessary laborers. Dr. Frederick G. Meyer will be a technical advisor for the garden and both the Horticultural and Educational Units will be involved.

Projects on Plants in the Landscape and a Strolling and Rest Area have been temporarily shelved. The former because it is tied in with the development of the main entrance, and the latter because of higher priority activities. Preliminary discussions have been held with the Audubon Naturalist Society of the Central Atlantic States, Inc., for the eventual development of a collection of shrubs and plants that attract birds. A location near the former site of the Braille Trail has been selected as a likely place to view birds in the Arboretum.

PLANTS, PLANTINGS, AND SERVICES

A. Plant Records, Mapping and Labeling

From September 1975, through December 1976, the following accomplishments are noted:

- A total of 2800 acquisitions of plants, seeds, scions, and cuttings were accessioned.
- Approximately 4,031 new record and display labels were added to, or replaced, in various plant collections throughout the Arboretum.
- An inventory and plant location map for the Japanese garden was completed.
- Major plant collection areas were defined on maps distributed to the Arboretum staff.
- Reorganization of the plant records file to include cards relating to herbaceous and research plants was completed. Specific reorganization of the rhododendron/azalea file in accordance with "The Azalea Book" by Frederic P. Lee was carried out at the same time.
- The Touch and See Nature Trail was closed due to repeated vandalism. A new location, with increased natural security, has been selected. Members of community blind and handicapped organizations will be asked to assist in design and planning of the new trail.
- Ms. Roberta Douglas assumed the position of Plant Recorder in May 1976. Ms. Douglas recently completed training in landscape architecture at George Washington University. Her undergraduate work at Wilson College and the University of Pennsylvania was in sociology and art history.
- Mr. M. Bishop attended a 10-week photographic course at the Smithsonian Institution enabling him to expand our photographic labeling processes at the Arboretum.

B. Plant Collections

Fern Valley and Daffodil-Ivy Collections. In the spring of 1976, a meadow project was initiated on the west side of Fern Valley. The project will serve as a study area for meadow vegetation of the mid-Atlantic region. It will also afford the visitor an opportunity to observe plant associations. Staff at the Morton Arboretum, long associated with this type of project, have been consulted in developing our project. The Ivy and Daffodil Collections have undergone considerable changes. The Ivy Collection has been increased with the addition of 21 authentic species and cultivars donated by the American Ivy Society. Inferior, misnamed or reverted accessions were removed. The collection of daffodil species and miniature cultivars was expanded with the addition of a rockery at the entrance to the planting. Miniature ivies will be planted in this location, also. A collection of rare *Galanthus* (snowdrops) and *Leucoium* (snowflakes)

species and cultivars donated by Richard Nutt, England, were planted in this area. During the summer of 1976, the Youth Conservation Corps (YCC) comprising a work leader and ten students, worked in Fern Valley on renovation projects. These include bridge and trail repair, stream bank stabilization, correction of runoff drainage problems and removal of undesirable vegetation. Educational signs describing Fern Valley, a meadow ecosystem and ferns were completed. These will be placed in the appropriate areas and, hopefully, will serve to inform visitors about the aspects of our native vegetation and natural environment. Photographs of Hedera (ivy) cultivars taken by Craig Keys, Gardener-in-Charge, appeared in the September 15, 1976, issue of American Nurseryman in an article entitled "From the Ground Up: Ivy is Basic." In April, Mr. Keys participated in the Wildflower Pilgrimage to Gatlinburg, Tennessee, sponsored by the University of Tennessee and the Great Smoky Mountain National Park. Various aspects of plant communities and associations were discussed at the workshops held during the three-day meeting. Some 150 species of wildflowers were observed in bloom.

Camellia Collection, Garden Club of America. The camellia area has been re-mapped and inventoried. Camellia cultivars found to be undesirable due to lack of hardiness were removed as were excessive duplicates of the same cultivar. With the aid of members of the Camellia Society of the Potomac Valley, 60 camellia plants were field grafted with new cultivars. Plants of an additional 120 new cultivars were obtained in cooperation with Laurel Lake Nursery, Salemburg, North Carolina, and the Camellia Society of the Potomac Valley. Additional woody and herbaceous material has been added to the Garden Club of America planting including Pieris, Stewartia, Hamamelis, Hosta, and Lycoris.

Azalea-Rhododendron Collection. Curtailment in hiring additional labor continues to restrict the level of maintenance desired for this area. Work continues on controlling the growth of honeysuckle, grape, and passionflower vines on the Azalea Hillside. Pre-emergence herbicides and mulch are being used to reduce hand labor in the control of weeds. The Azalea Valley, Azalea Loop, Gotelli Rhododendron Walk, and Lee Garden have been re-mapped and inventoried. A complete collection of the Glenn Dale azaleas as described by B.Y. Morrison has been assembled. A collection of eight cultivars of Back Acre azaleas has been added to the Lee Garden. Additional groundcover plants such as Hosta, Liriope, Ophiopogon, and Epimedium have been added to the Lee Garden.

Bonsai Collection. Since the last report a great deal of activity has centered around the Collection. We are pleased to report that all 53 plants have been released from quarantine and are thriving in their new home. The first phase of the bonsai complex designed by Mr. Masao Kinoshita of Sasaki Associates, Inc., Watertown, Massachusetts, and constructed by East Atlantic Construction Company, Washington, D.C., was finished, or nearly so, for the dedication of the Collection and

complex on July 9, 1976. Secretary of Agriculture Earl L. Butz hosted the event, attended by over 2,000 invited guests. Among the honored guests participating in the program were Fumihiko Togo, Ambassador of Japan; Mr. Nobukichi Koide, Director, Nippon Bonsai Association; and Henry A. Kissinger, Secretary of State. A special thanks must be given to the National Capital Area Federation of Garden Clubs, the American Association of Nurserymen and the many nurserymen who contributed plants, the Department of Agriculture's Office of Communication, and the Northeastern Region's Information Office for their contributions to the success of the event. A countless number of newspaper and magazine articles have been written on the Collection. Copies of some 57 articles, many multi-page spreads, have been brought to our attention. A program aid on the Collection has been prepared. Mr. Robert F. Drechsler, Collection Curator, has given 30 talks on the Collection at various horticultural and non-horticultural meetings. Visitor attendance has been most gratifying, with nearly 45,000 viewers from July 9 to December 31, 1976. The highest visitation day was 1,287 on a Sunday. Two information receptionists were employed on 700-hour appointments to assist in informing the public concerning the Collection. Mrs. Ruth Lamanna and Mrs. Dorothy Warren, bonsai specialists, continue to volunteer their invaluable assistance in the care of the Collection.

A dual security system has been installed to protect the bonsai from theft. Following our conservative philosophy in the care of the bonsai, a section of the shelter was covered over and all the plants placed in this area for the winter. Small propane heaters were used to keep the temperature above 25 degrees F. As of March 1, all the bonsai will be in their "normal" place in the shelter.

At the invitation of the Nippon Bonsai Association, Mr. Drechsler will spend from March 15 to April 15, 1977, at the bonsai village of Omiya in Japan. During this period he will study and receive intensive training in the art of bonsai root pruning and repotting. Those of us closely associated with the bonsai are deeply gratified by the world-wide interest in bonsai and the National Arboretum that the Collection has created.

Gotelli Conifer Collection. As of December 31, 1976, 690 species, varieties and cultivars have been authenticated. Each plant is documented with accurate, up-to-date records in the accession catalog, with locations noted on up-dated maps. One thousand forty-three herbarium voucher specimens, with photographs and complete habitat and botanical descriptions have been placed in the herbarium. This encompassed approximately 48% of the collection. Fifteen conifer accessions have been added to the collection. Additional illustrated display labels have been designed and prepared for placement in the

collection, bringing the total number of labels to 72. During the reporting period, 54 requests for 218 accessions were filled. A collection of 10 cultivars of Adonis amurensis were established in the winter of 1975. This early spring-flowering perennial is rarely cultivated in this area. In Japan, Adonis amurensis is rather widely grown and often presented as a pot-plant on New Years Day. In the fall of 1976, Dr. Creech and Mr. March visited the Nakamura Nursery at Oosatogua, Saitama, Japan, where Adonis is mainly cultivated, and obtained another collection of cultivars for this planting.

Special Items

The Division of Reptiles and Amphibians, National Museum of Natural History, Smithsonian Institution, has initiated a study of the reptiles and amphibians of the District of Columbia to determine the effects of urbanization on species diversity and population density. The fauna of "natural" areas such as Rock Creek Park is amazingly depauperate, possibly due to pollution. The Arboretum offers a wide range of habitats for reptiles and amphibians. It has the added advantage of being controlled and protected from most of the influences of the surrounding metropolitan area. A comparison of the herpetofauna of the Arboretum with other areas is being made to determine whether or not this "protection" has any effect on the number of species present or their density. Included in the data to be provided to the Arboretum will be an annotated list of species found. The study covers the period, Spring-Winter 1976.

The Youth Conservation Corps (YCC) was started as a pilot project by an Act of Congress in 1970. In 1974, Congress made the Act permanent. The purpose of the Act is to further the development and maintenance of the natural resources of the United States by America's youth, and in so doing, to prepare them for the ultimate responsibility of maintaining and managing these resources for the American people. Three equally important objectives are reflected in the law:

- (1) Accomplish needed conservation work in public lands.
- (2) Provide gainful employment for 15- through 18-year-old males and females from all social, economic, ethnic, and racial classifications.
- (3) Develop an understanding and appreciation in participating youth of the nation's natural environment and heritage.

Congress designated the Departments of the Interior and Agriculture to sponsor the program. The Secretary of Agriculture has designated the Forest Service to administer the program for Agriculture. In 1976 the Forest Service and the Agricultural Research Service signed a memorandum of understanding establishing a pilot YCC project at the Arboretum and Beltsville. The program, Federally funded, provided for a Camp Director and 10 metropolitan Washington youths for a two-month period. Fern Valley served as a base of operations for the project. Work accomplished in the Valley included foot bridge maintenance,

erosion control-drainage ditch maintenance, stream bed stabilization and debris removal, raising of a foot path, stabilization of an eroding bank, mulching foot paths, installation of a protective border around fern plantings, and the eradication of undesirable seedlings. The appraised value of work accomplished was \$8,160. Beyond the significant dollar value of the work accomplished, the program provided these metropolitan Washington youths with an understanding and appreciation of the nation's natural environment by actively participating in its conservation. Much credit for the success of the Arboretum's program goes to the Camp Director, Ms. Judy Barger. Looking to 1977, we expect to participate in the program again with, perhaps, 13 youths, a Camp Director, and an assistant.

C. Plant and Seed Distribution Programs, 1975-1976

Domestic Plant Distribution

Number of participating arboreta, botanic gardens and research institutions.....	231
Number of institutions requesting plants.....	123
Number of items available for distribution.....	46
Number of plants sent.....	4582

Commercial Plant Distribution

Number of participating nurserymen.....	40
Number of nurseries requesting material.....	18
Number of items available for distribution.....	7
Number of plants sent.....	534
Number of scions sent.....	515

Special World-Wide Distribution - NA Introductions

Viburnum 'Erie' and 'Cayuga'

Number of arboreta, botanic gardens and research institutions participating.....	303
Number of institutions requesting plants.....	163
Number of plants sent: 'Erie'.....	340
'Cayuga'.....	170

Special Mini Domestic Plant Distribution - Surplus

Plants Available in Limited Quantities

Number of arboreta, botanic gardens and research institutions participating.....	10
Number of institutions requesting plants.....	10
Number of items available for distribution.....	9
Number of plants sent.....	128

Special Domestic Azalea Distribution

J. L. Creech Hybrids

Number of arboreta, botanic gardens and research institutions participating.....	231
Number of institutions requesting plants.....	116
Number of items available.....	3
Number of plants sent.....	1176

Special World-Wide Distribution - Rhododendron Species

Number of arboreta, botanic gardens and research institutions participating.....	49
Number of institutions requesting plants.....	28
Number of items available.....	8
Number of plants sent.....	900

Formal Overseas Seed Exchange - Index Seminum

Number of arboreta, botanic gardens and research institutions participating.....	240
Number of institutions requesting seed.....	120
Number of seed packets sent.....	2306

Special Requests - World Wide for Plant Material from NA Collections

Number of requests for plants.....	104
Number of plants sent.....	1285
Number of requests for seed.....	57
Number of seed packets sent.....	187
Number of requests for cuttings/scions/divisions....	82
Number of cuttings/scions/divisions sent.....	9404

Selected examples of the above listed requests include: Prunus scions from a selection of ornamental cherries to Dr. Anatoly Merezko, fruit specialist, Vavilov Institute of Plant Industry, Leningrad, USSR; seed of Evodia danielli and Idesia polycarpa to Morton Arboretum as a contribution to the American Horticultural Society Seed Program; seed of several evergreen Quercus species to B. J. Simpson, Texas A&M University, Research and Extension Center, Dallas, for testing adaptability to areas in Texas; seed of native American trees (Betula, Oxydendrum, Cornus, Magnolia, Tilia) to three botanical gardens, Peoples Republic of China; seed of Sambucus coerulea, S. racemosa var. microbotrys, S. canadensis, collected in the wild, to P. W. G. Sale, University of Sydney, Australia, for taxonomic investigations in the genus Sambucus; plant and branch samples of Franklinia alatamaha to P. R. Kremer, Pennsylvania State University, as comparison samples for a paleontological study of organic sediments and peats found in northern Florida-southern Georgia environs of Okefenokee Swamp; cuttings of selected conifers to R. Baker and M. Corio, Department of Horticulture, University of Maryland, for propagation experiment; divisions of Hemerocallis x aurantiaca to Ute Koppers, Am Brunnchen, West Germany, for use in breeding project; cuttings of three unusual azalea cultivars to Phyto Ecology Nursery, Ridgely, Maryland; vegetative buds of Betula, Fagus, Carpinus, Ostrya, Quercus, etc., to Dr. D. H. Franck, Department of Botany, University of Wisconsin, for analysis of leaf venation ontogeny; seed of Cornus sp. to Mr. K. Hatta, Hakone-Machi, Japan, for taxonomic study of the genus Cornus; rooted cuttings of native east coast rhododendrons to the Rhododendron Species Foundation, Takoma, Washington; budwood of Malus purpurea 'Aldenhamsensis' to Dr. R. Stouffer, Pennsylvania State University Fruit Research Laboratory, for use in virus research program; seed of native, wild collected Acer spp.

to the Savannah River Ecology Lab, Aiken, South Carolina, for genetic studies with Acer; cuttings/scions of 26 dwarf conifer cultivars to the Botanical Garden, University of British Columbia, Vancouver, Canada, for adding to their collection; and cut specimens of five native East Coast plants to Henry Evans, Printmaker, San Francisco, California, for use as print subjects.

<u>Total Number of Plants, Cuttings/Scions/Divisions,</u> <u>Seed Packets Shipped</u>	
Plants.....	9115
Cuttings/scions/divisions.....	9919
Seed packets.....	2493
<u>Total Number of Shipments.....</u>	821

Plant Acquisitions (some significant donations/purchases)

A collection of 37 species and cultivars of Asarum, Epimedium, Hedychium, Hosta, Liriope, Lycoris, and Ophiopogon from the garden of Mrs. Frederic P. Lee, Bethesda, Maryland; 13 "missing" Glenn Dale azalea cultivars from George Harding, Germantown, Maryland; 4 species and 3 cultivars of Narcissus from The Daffodil Mart, North, Virginia; 31 cultivars of Narcissus from Murray Evans, Corbett, Oregon; cultivars of 5 Nandina, 4 Pieris, and 9 conifers from Mitch Nursery, Aurora, Oregon; 11 species and cultivars of Liriope and Ophiopogon from Clarence Lantis, Bethel, Delaware; 7 cultivars of Camellia japonica from Arthur Maryott, Bethesda, Maryland; 5 Camellia japonica cultivars from Mrs. Francis Fitzhugh, McLean, Virginia; 18 species and cultivars of Galanthus and Leucojum from Richard Nutt, London, England; a collection of 178 rare and unusual species and cultivars from the wild and nurseries in Japan collected by Barry Yinger, Wheaton, Maryland, in cooperation with Longwood Gardens, Kennett Square, Pennsylvania, and the National Arboretum; 12 cultivars of Hedera helix and 3 Hedera species from the American Ivy Society Research Center, La Plata, Maryland; 6 Hedera helix cultivars from Leo, Swicegood, Rescue, Virginia; Zantedeschia aethiopica 'Green Jade', a "hardy" cultivar, from Treseders Nursery, Cornwall, England; Magnolia stellata 'Centennial' from The Arnold Arboretum, Jamaica Plain, Massachusetts; 100 plants of Ilex cornuta 'Carissa' from Wight Nursery, Cairo, Georgia; 12 Robin Hill azalea cultivars and selections from Robert D. Gartrell, Wyckoff, New Jersey; Juniperus scopulorum 'Tollisons Weeping' from Monrovia Nursery, Azusa, California; 810 accessions of seed, plants, and cuttings of rare and unusual wild and cultivated material collected by J. L. Creech and S. G. March in Japan under a plant exploration grant from the Merrill Foundation.

D. Plant Exploration in Japan

Dr. Creech and Mr. March undertook a plant collecting trip to Japan from October 11 to December 1, 1976. This exploration was designed to visit an extensive number of rare plant nurseries and remote areas such as Yakushima Island, Hirado Island, and Mt. Ashitaka. The trip was supported with funds contributed to the Friends of the National Arboretum by the Charles E. Merrill Trust.

The Japanese, both government officials and nurserymen, were especially cooperative in arranging for permission to collect in forest reserves and to visit rare plant gardens. As a consequence, 810 collections of trees and shrubs were made. These largely consisted of species and rare cultivars not grown in the United States. In many instances, it is likely that some of these might not be available in the future. New sources of Lagerstroemia fauriei were located, and a great array of azaleas, including both species and recently developed races of cultivars. All the major nursery areas of Japan were visited and excellent working relationships with Japanese botanic gardens were developed.

In addition to the extensive collections of plants, a number of books on Japanese garden plants were obtained.

A visit was made to the owner of the most extensive private herbarium of Japanese plants. The collection covers about 80% of the flora, with over 150,000 specimens. It is believed that this collection could be acquired for the National Arboretum at a modest figure.

EDUCATION, PUBLIC SERVICES AND LIBRARY

A. Education and Information

Response to Public Queries. The Education Office answered 6,750 questions about plant problems and horticultural events; 4,350 by telephone, 1,450 by letter, and 950 through personal contact at the Information and Activity Center.

Volunteer Guide Service. Thirty-eight volunteers conducted 165 tours during the past year. An intensive training course for volunteers has been held throughout the spring and summer months to acquaint the volunteer guides with plant collections and on-going programs at the Arboretum. The professional staff and plant society specialists participated in the training sessions. The volunteer guides under the supervision of the National Capital Area Federation of Garden Club's Volunteer Guide Chairman, Mrs. Judson French, held intensive guide training classes covering a wide range of topics. A series of five classes on bonsai were conducted by Mr. Clifton Pottberg, a local bonsai expert.

School groups and garden clubs accounted for nearly one-half of the above tours, with the balance consisting of senior citizens, junior garden clubs, county extension tours, diplomatic wives, garden editors, college groups, miscellaneous professional groups, and others.

In addition to the tours handled by the volunteer guide service, 67 tours were conducted by members of the Arboretum staff.

Botanical Art Displays. Throughout the year, monthly displays of a botanical or horticultural nature, representing a variety of media and subject matter have been exhibited in the lobby of the Administration Building and at the Information and Activity Center.

Arboretum Exhibits. Arboretum staff members have provided the following special exhibits for display at various functions:

- Bonsai Exhibit - Bicentennial Flower Show, National Capital Area Federation of Garden Clubs, Inc., U.S. Botanic Garden.
- Bonsai Exhibit - Twelfth Annual Spring Flower Show, Co-sponsored by the Takoma Horticultural Club and Takoma Azalea Committee, Takoma Park Municipal Building.
- The U.S. National Arboretum, 1975 Metropolitan Horticultural Happening, Landover Mall, Landover, Maryland.
- In conjunction with the dedication of the National Bonsai Collection, the Arboretum along with numerous horticultural, bonsai, and related organizations provided special exhibits through the month of July in the auditorium of the Administration Building.

The following organizations participated with an exhibit: American Bonsai Society, Animal & Plant Health Inspection Service, American Horticulture Society, American Association of Nurserymen, Bonsai Society of Greater New York, and the Bonsai Clubs International.

- Bamboo Artifacts from Georgia - The National Arboretum acquired a superb collection of bamboo artifacts which were previously housed in a small museum at the USDA Plant Introduction Station, Savannah, Georgia. These artifacts which include numerous pieces of furniture, baskets, tools, vases, traps, and even toys will fit nicely into the planned research/education center to be developed in the brickyard area along New York Avenue. It is hoped that the bamboo collection will eventually be on permanent display and perhaps be used at times when the Arboretum is putting on shows, particularly for flower arrangements or indoor Japanese gardens.
- Bicentennial State Wildflower Prints - A collection of State wildflower prints was given to the National Arboretum by the Franklin Mint, Franklin Center, Pennsylvania. In the series, "Flowers of America", originally commissioned by the Franklin Mint, we see a unique collection of State flower paintings which symbolizes the unity of diverse elements that make the United States of America the great country it is. The framing was contributed by members of the National Capital Area Federation of Garden Clubs, Inc., other botanical and horticultural societies, and individuals. An extra personal touch has been given the Arboretum set by the adding of a remarque on each print by the artist, Miss Jeanne Holgate, one of the talented flower painters of our time.

Popular Publications. Seven Program Aids (PA) and USDA Home and Garden Bulletins (HG) were written or revised during the period September 1975, through December 1976. A Program Aid on the Gotelli Dwarf Conifer Collection, written in 1974, is in the final proof stage before going to press. This publication should, after numerous delays, be available in early 1977. PA #309, "The United States National Arboretum, Washington, D.C." has been translated into several foreign languages so that it may be duplicated and made available to foreigners visiting the National Arboretum.

An Agricultural Information Poster in full color featuring the National Arboretum should be available in 1977. This publication will supersede the publication on the Arboretum which was produced at the time of the dedication of the Administration Building in 1962.

Thirty-two Correspondence Aids were prepared or revised for public distribution.

Radio-TV and Talks. Mr. Erik Neumann, Curator of Education, taped 14 programs for local and national radio and television, and presented 46 talks to groups ranging from garden clubs, high school, and college classes to educational specialists and press groups.

Special Projects. Mr. Neumann is involved in several Metropolitan Washington projects including the following:

- The Widening Horizons Classroom and Field Demonstrations - Twenty-five to 40 students participated in each of three programs. Widening Horizons is a District of Columbia project to acquaint under-privileged youth with government activities and opportunities. Within each participating Federal agency, the program is hosted by wives of cabinet-level officials.
- Future Farmers of America - Serves as member of the Ornamental Horticulture Study Committee of the FFA. The consulting committee is charged with evaluating and revising the Ornamental Horticulture Proficiency Award Program to make the program more challenging and meaningful to more FFA members.
- District of Columbia Experiment Station - Serves as member of the Advisory Board. The Station, established by congressional action, has as its mission the conduct of appropriate problem-solving research related to food and consumer economics, outdoor recreation, and environmental quality. The principal functions of the Advisory Board are: (1) providing advice on the nature of problems to be undertaken in relation to need and financial resources; (2) assisting in keeping citizens informed of experiment station goals and objectives; (3) supporting requests for research funds from the District Government, the Congress, and other public and private organizations; and (4) periodically reviewing the experiment station's program of research and advising on alternatives for improvement.
- Career Development Exemplary Project, D.C. Public Schools - Mr. Neumann is a consultant for this group. Duties include (1) lecturing on the Arboretum's research and education programs and on how the Arboretum may be used as a resource tool by the public; (2) providing teacher participants an opportunity to witness the demonstration and discussion of a variety of career education strategies and how to integrate concepts of career education with school subjects in providing meaningful and relevant experiences to students about the "world of work"; (3) sharing occupational or professional knowledge, skills, and abilities and identifying jobs similar to but requiring different experience, education, training, or skills; (4) explaining the organizational structure of the Arboretum and the different jobs within it; and (5) helping students match their interests and abilities with knowledge of job requirements and benefits.
- The New World of Urban Gardening - Serves as member of their Planning Committee. The New World of Urban Gardening is holding a horticultural fair at the Arboretum in the spring of 1977. The fair is a cooperative venture sponsored by the CURB Beautification Division of the Department of Environmental Services of the District of Columbia.

- School Without Walls Program, District of Columbia - In cooperation with this group, the National Arboretum accepted a volunteer trainee to provide him with experience in a given work situation. The students in this program have difficulty learning in a formal classroom situation. Participating students receive high school credit towards graduation.
- National Bird Garden Committee - Mr. Neumann serves as a member of this committee along with members of the Audubon Naturalist Society of the Central Atlantic States who have an interest in creating a national bird garden at the National Arboretum. This garden is to be designed to demonstrate good principles of landscaping to attract birds and other wildlife. In a real sense, the entire Arboretum is a bird garden. The purpose of dedicating a special area is to provide a focal point for drawing attention to the Arboretum's birdlife and a demonstration of what can be done with plantings, feeders, nesting boxes, and baths to attract birds. The garden will satisfy the basic needs of birds--food, shelter, water, nesting, and roosting sites--in a way that is both esthetically pleasing and ecologically sound. It will be a place where the careful observer can see a variety of birds at any time of the year or gain new ecological insight from serious study, and where the casual visitor can simply enjoy nature and the beauty of the Arboretum in quiet, pleasant surroundings. The bird garden also will be the focus of a new Arboretum-wide systematic investigation by members of the Audubon Naturalist Society of the food and habitat preferences of birds. Despite much published information on this subject, there is a great need for additional research. This fits right into the basic aims of the Arboretum and will add a whole new dimension to our current research/education program. It is hoped that a National Bird Garden will become a truly national example and inspire similar gardens all across the country. A 15-acre site in the vicinity of the "M" Street entrance has been designated for this garden. Systematic bird counts were made in February 1977, in order to obtain a measure of bird use of the proposed site prior to its development.
- USDA Graduate School Committee on Field Studies and Horticulture - Serves on this committee as coordinator of the U.S. National Arboretum Horticulture Series. Responsibilities include selection of instructors, course content, and promotion of the program. Regularly attends USDA Graduate School Teach/Learning Effectiveness Workshops held for Graduate School faculty and staff. Thirty-five classes in the National Arboretum Horticulture Series have been offered including: Herbs; Growing Roses; Shade Trees; Orchids; Christmas Decorations with Plants; The Home Greenhouse; Dying with Natural Materials; Introduction to Indoor Bonsai; Plants in the Home; Indoor Light Gardening; Basic Methods of Plant Propagation; Botany for Gardeners; Vegetable Gardening; Control of Insects and Plant Diseases in the Home Garden; General

Ornamental Plant Culture and Care; Annuals, Perennials and Bulbs; and Ornamental Evergreens for the Landscape. The Adult Education classes are taught in a 3-to 5-session format, making use of classroom and greenhouse facilities at the Arboretum. Instructors included Arboretum staff members as well as specialists from local plant societies and the Extension Service.

Meetings and Events. Regularly scheduled horticultural and botanical organization meetings are held in the Arboretum auditorium. The Botanical Society of Washington, National Capital Orchid Society, Indoor Light Gardening Society, The Gloxinia and Gesneriad Society, Washington Bonsai Club, and Orchid Judging Center meet on a monthly basis; Camellia Society of the Potomac Valley, Potomac Valley Chapter of the American Rhododendron Society, and Brookside Bonsai Club meet bi-monthly; The National Capital Daffodil Society, Washington Daylily Club, and Potomac Lily Society meet quarterly; and the Potomac Valley Chapter of the American Rock Garden Society meet annually. The National Capital Area Federation of Garden Clubs, Inc., hold bi-monthly meetings at the Arboretum, as well as various committee meetings throughout the year including a flower show school and landscape critics council.

District of Columbia Cooperative Extension Service held its CORE training in fulfillment of EPA regulations, as well as the Ornamental and Turf Pest Control Workshops and examinations at the Arboretum.

The following plant societies held flower shows in the auditorium of the Administration Building: Indoor Light Gardening Society, Potomac Valley Camellia Society (both spring and fall shows), Washington Daffodil Society, Potomac Bonsai Association, National Capital Daylily Club, Potomac Lily Society, D.C. Adult Education Standard Flower Show, Potomac Valley Rhododendron Society, and the National Capital Orchid Society. These flower shows play an important role in the Arboretum's educational program, and their attendance is overwhelming.

Tours, Horticultural Demonstrations, Films, and Nature Walks. In order to keep the public informed of events at the Arboretum, the Education Office is issuing a quarterly events newsletter listing nature walks, tours, horticultural and botanical films, special exhibits, horticultural demonstrations, and lectures held at the Arboretum. A separate listing of flower shows and art exhibits is prepared annually. The events newsletter and listing of flower shows and art exhibits is now mailed to over 6,000 individuals who have requested notice of National Arboretum activities. These publications have been sent on a regular basis to the Washington Convention and Visitors Bureau, local newspapers, and radio and television stations for listing and for publicity purposes.

Events for 1975-76 have included: Tours of the Gotelli Dwarf Conifer Collection; Native Plant Walks; Holly Walks; Daffodil Walks; Wildflower Walks; Azalea Walks; Dogwood Walks; Bird Walks; Tree Identification Walks; Demonstrations on Growing Orchids; Lectures on

Collecting Orchids in Brazil; Decorative Uses of Lighting; Indoor Bonsai and Collecting Plants for Bonsai; Palmistry--Past, Present; Endangered Plant Species; Christmas Flowers Under Lights; Plant Introduction Highlights at the National Arboretum and Glenn Dale Plant Introduction Station; Seasonal Variation in the Marine Flora of the Gulf of California; and Plant Exploration in South Africa.

Special Items

Recommendations on groundcover plants for plant hardiness zone 7 were provided to the American Association of Nurserymen for use in a future publication on this subject.

Recommendations were made to the Cooperative Extension Service of the District of Columbia towards a comprehensive list of trees and shrubs for the Washington Metropolitan area.

A concentrated effort has been made to photograph plant material commonly used in the landscape in order to assemble a comprehensive set of 35mm slides to be copied and made available for teaching purposes through the Education Committee of the American Society for Horticultural Science.

Beginning in July of 1976, an effort has been made to obtain educational films of a botanical or horticultural nature to show to the public in the auditorium of the Administration Building. Films on Bonsai, Japanese Gardens, Western Wildflowers, Ikebana, Gardens in South Africa, House Plants, Gardens in Scandinavia, British Gardens, and a film on the National Arboretum have been shown to date.

Safety films on flammable liquids, proper lifting, and fundamentals of proper pesticide application have been shown to the Arboretum employees.

A film series on Bonsai and Japanese Gardens shown during the month of July in conjunction with the dedication of the National Bonsai Collection were of particular interest. Shown up to eight times a day, seven days a week, in the auditorium, the films were viewed by eight to ten thousand individuals.

In cooperation with the National Capital Area Federation of Garden Clubs (NCAFGC), two sleeves of 35mm color slides are being produced for sale in the sales area at the Information and Activity Center. The slide sets will feature general Arboretum scenes and the Bonsai collection and will be sold by NCAFGC volunteers in their recently expanded sales area along with other items relating to the Arboretum and horticulture.

Under a cooperative agreement with the NCAFGC, volunteer aids are provided to staff the Information and Activity Center. Some daily instruction and orientation concerning collections, programs, and special events at the Arboretum is offered to the volunteers by Ms. Mary Ann Jarvis, Education Office Assistant.

B. Library

Members of the Library Committee for 1976 were Chairman Erik A. Neumann, Frederick G. Meyer, Gene Eisenbeiss, William L. Ackerman, and ex-officio, John L. Creech and Jayne T. MacLean. National Agricultural Library (NAL) delegates were Deputy Director Wallace C. Olsen and Charles Bebee, Chief of Reference, as alternate. Monthly meeting agendas have ranged from long-range planning for the library in light of the Arboretum's expansion programs to the selection of new books.

Collection Growth - Purchases. Still pursuing the goal of the finest book collection possible consonant with the needs of the Arboretum and its public, the Library Committee carefully reviews all purchase recommendation, reviews, booklists, ads and other source materials in its selection process. Budget limitations are not as restrictive as they once were. Since 1973, when the original Memorandum of Understanding between the National Arboretum and the National Agricultural Library was drawn and the Arboretum's book purchase budget was set at \$1,000, NAL has raised the allocation each year until the figure for fiscal 1977 is \$2,900. Since September 1975, 138 books have been ordered, and 108 of these have been received, catalogued and forwarded to us. Some of the subjects covered are plant systematics, plant diseases and pests, bonsai, genetics and cytogenetics, evolution, plant identification, special growing and gardening techniques, and monographs on specific genera.

Collection Growth - Gifts. Many of our gift books received during the past 16 months have had an oriental flavor. Bonsai-oriented visitors and correspondents contributed many books on bonsai and Japanese gardening in connection with the dedication of the Bicentennial gift from Japan. Books on magnolias, azaleas, bulbs, herbs, camellias, conifers, ferns, violets, and orchids were also received, as well as various reference works such as bibliographies, dictionaries, regional floras and manuals. Gifts came from the Library's share of the Friends of the National Arboretum fund, from visitors, authors and our own staff, as well as USDA's publications presses, and totaled 94 items.

Serials and Catalogs. The cost of periodical and serial publications has continued to rise along with the prices of books, and as a result a few expensive subscriptions were dropped. However, a few new ones have been added, and the number of subscriptions received regularly, both free and paid-for, remains at about 200. During the reporting period (most of FY '76 and half of FY '77), the National Arboretum's expenditure for serial subscriptions was \$3,270.

A survey of the nursery catalog collection revealed many gaps, especially in current catalogs. To update the collection, a form letter is being sent to nurseries who used to send us catalogs, asking that they resume. Response so far is good. The next step will be to develop a list of other appropriate nurseries and request those

catalogs. We do not wish to compete with the extensive nursery and seed trade catalog collection at NAL; ours is intended to concentrate mainly on firms specializing in woody plants.

Technical Services. A bonus of extra clerical assistance allowed us to add a few locating aids in the library, such as posted periodical shelf lists in the stacks; tabs on catalog cards for books on reference shelves, folio shelves or the rare book case; and a more useful arrangement of nursery catalogs.

The acquisition process via NAL has been speeded up, because of their participation in the Ohio College Library Center (OCLC) shared cataloging program, a computer-based system which links hundreds of libraries across the country, and saves much duplication of cataloging work. The Arboretum library has so far participated only indirectly in this program, but in 1977 will have direct computer terminal access for the purpose of recataloging about 2,000 books from our collection. The Arboretum is hiring a library technician for the duration of the special project, and NAL is lending us a terminal and paying all costs associated with its operation for six months.

Readers Services. Services provided by libraries and librarians are hard to measure, especially in terms of quality, a subjective measurement which must be made by the users. Nevertheless, statistics are kept which offer some idea of quantity, although the numbers are probably greater than ever get recorded. Only Arboretum employees may borrow books, and for the reporting period loans totaled 506. The number of readers who came to the library was 2,653, mostly local staff, but 592 of them visitors. Self-service by users numbered about 3,700 books and serials. Reference questions, including telephone inquiries, directional queries and substantive reference questions from readers and correspondents, came to 1,202.

Orientation was given to new users of the library, and to keep the staff abreast of the new literature, lists of accessions continue to be issued periodically, and "Current Contents" - type notices showing the contents pages of current periodicals are issued weekly. The librarian continues to maintain liaison between Arboretum staff and NAL.

All this seems to add up to a small library well-focused on its users' interests, which is able to serve as a foundation for their research and a resource for their writings. Besides staff authors, more and more members of the writing public have "discovered" us lately. One soon-to-be-published work on identification of wild flowers brought its author here every week for several months, both to consult reference books and to obtain advice from Dr. Meyer. University of Maryland students from the horticulture classes descended on us in droves to complete assignments on Japanese gardens. Bonsai lovers have come in great numbers during the year, and especially in July around dedication time. The librarian prepared an extensive bibliography on bonsai that

used as a handout and is still being distributed. Other such lists of our special interest holdings, such as on herbs, are planned for this coming year.

Travel and Meetings. The Librarian participated in the following meetings:

- Symposium. "Agricultural Literature: Proud Heritage -- Future Promise." Sept. 24-26, 1976, National Agricultural Library, Beltsville, Md.
- Annual Meeting. Council on Botanical and Horticultural Libraries. May 6-8, 1976, Wilmington, Delaware.
- Special Bicentennial Conference. "America in the Information Age." American Society for Information Science. April 12-14, 1976, Washington, D.C.

ARBORETUM RESEARCH

A. Nomenclature and Taxonomy of Cultivated Plants

Cultivated Trees and Shrubs of Southeastern United States. About 550 collections were made by Dr. Meyer and Mr. Peter Mazzeo during the reporting period at 20 sites in Maryland, District of Columbia, Virginia, North Carolina, South Carolina, Georgia, and northern Florida. The identification and critical study of this material is now in progress. Aims, objectives, and results of earlier field work have been previously reported. More recent field work is covered, in part, by this report, as follows:

--Virginia - Claremont Manor, Surry County on the James River. This is an old property dating from a land grant of 1649. The more recent plantings date from the early 1950's. A number of old specimen trees on the grounds include an avenue of lindens (Tilia sp.); a double row of 30 large crapemyrtles; a white-flowered crapemyrtle, 20 ft. tall; willow oak (Quercus phellos), D.B.H. 6 ft. and 100 ft. tall; cucumber-tree (Magnolia acuminata), D.B.H. 6 ft. and 70 ft. tall; Chinese chestnut (Castanea mollissima), D.B.H. ca. 3 ft. and 40 ft. tall.

Chippokes Plantation State Park, Surry County. Listed as one of the oldest properties in Virginia, dating to 1619. Many handsome, old, native cedars (Juniperus virginiana) are scattered about the garden. A selection of specimen trees and shrubs planted near the mansion house (the collection is not large), includes Aesculus glabra, Koelreuteria paniculata, Chionanthus virginicus, Halesia carolina, Cotinus coggygria, and Oxydendrum arboreum.

Colonial Williamsburg. Two trips to the area were made to complete documentation of the woody plants in the Historic Area, Visitor's Center, Providence Hall, the Inn, and the Lodge. The total area devoted to ornamental plantings is not only extensive, but the collections of ornamentals in these sites are among the most significant on the East Coast. A few of the interesting collections on these trips included several uncommon plants, including the double-flowered jessamine (Gelsemium sempervirens 'Pride of Augusta'); Adina rubella, an

interesting relative of Cephalanthus, the button-wood; Evodia danielii; snow-wreath (Neviusia alabamensis); Chinese box-orange (Severinia buxifolia); and shrub rockrose (Cistus hybrida). The red buckeye (Aesculus pavia), a much-admired native small flowering tree, is widely used in the Williamsburg plantings.

--North Carolina - A recent report of a large cultivated specimen of the rare Florida torreyia (Torreya taxifolia) near Norlina in Warren County, stirred some anxious excitement. In the wild, the tree is seriously threatened by extinction from a debilitating leaf fungus that eventually kills the tree. However, the tree is cultivated in various places outside the range of the fungus and no doubt will continue to persist in gardens. At the end of October 1975, the Norlina site was visited to obtain herbarium material, seeds, and cuttings of this magnificent specimen, which measures 50 ft. tall with a branch spread of 50 ft., and a girth of 9 ft. 7 in. Records show the specimen was planted about 1840.

Miss Elizabeth Lawrence, a garden writer and expert plantsman, has brought together an outstanding collection of rare plants in her Charlotte, North Carolina, garden. A few of the more interesting plants are: Kadsura japonica, strawberry-tree (Arbutus unedo), hermaphrodite form of butcher's-broom (Ruscus aculeatus), Osmanthus 'San Jose', Ilex latifolia, loquat (Eriobotrya japonica), Alexander's laurel (Danae racemosa), and Evodia hupehensis.

--South Carolina - Middleton Place Gardens, near Charleston. Established about 1730, these are the oldest landscaped gardens in America. Collections made in spring and fall of 1976 were the third and fourth visits to the site. Although azaleas and camellias have always been a special feature, many large specimen trees and shrubs, both native and exotic, are scattered throughout the garden, of which the following are worth mentioning: Crape-myrtle (Lagerstroemia indica), 50 ft. tall, 11-1/2 ft. in girth (several others are nearly as large); devilwood (Osmanthus americanus), 45 ft. tall; Magnolia grandiflora, 70 ft. tall; Ligustrum lucidum, 50 ft. tall; Spanish oak (Quercus falcata), 125 ft. tall. The very large and magnificent Middleton oak (Quercus virginiana) has a girth of 30 ft., a branch spread of 145 ft. and is 85 ft. tall.

Magnolia Gardens, near Charleston. Established by the Reverend John Drayton, about 1840. During the 1840's, the garden established the first Belgian azaleas grown in this country. Camellias are also extensively grown. The rare Camellia granthamiana was brought into the garden more recently and appears to be completely at home in these surroundings. The garden also contains a number of quite remarkable specimen trees, including a large Osmanthus fragrans, 40 ft. tall (probably the ancestral type of the tea olive); redwood (Sequoia sempervirens), 70 ft. tall; balearic box (Buxus balearica), ca. 15 ft. tall; and Ilex latifolia, 50 ft. tall.

Summerville. The Pinehurst Tea Gardens were established for the cultivation of tea at the end of the 19th century. At the same time, many exotic trees and shrubs were introduced to the tea gardens for experimental testing. Although the growing of tea has long since ended, tea hedges and also a few other exotics still persist on property which is now a housing development. Specimens of particular interest are a fine pencil cedar (Calocedrus decurrens), 70 ft. tall; Aphananthe aspera, a Japanese elm relative, 50 ft. tall; and several large banana shrubs (Michelia figo), 20 ft. tall with trunks up to a foot in diameter.

--Georgia - Garden of Mr. and Mrs. Jack Jones, Sr., at Turner's Rock near Savannah, contains a rich assortment of woody plants, including a large collection of camellias and azaleas. Specimen plants of particular note in this garden are the winter-flowering cherry (Prunus campanulata), the showiest winter-flowering tree with rose-red flowers that bloom in February; Buddleia fallowiana, with highly fragrant lavender flowers; Acanthopanax trifoliatum, a fall-blooming shrub with scrambling branches; Ardisia crenata, which naturalizes in this garden; and Cassia coluteoides, an attractive South American shrub with masses of bright yellow flowers at the end of October.

--Florida - Maclay State Gardens, Tallahassee. Covering an area of over 15 acres, the gardens contain an extensive assortment of native and exotic species, plus many azaleas, grown in the northern sector of Florida. Material documented on two earlier trips has already been reported. The more interesting plants obtained at the end of March 1976, were Cherokee rose (Rosa laevigata); tung-tree (Aleurites fordii); Mediterranean fan palm (Chamaerops humilis); Mahonia fortunei; Pasania glabra; winter-flowering cherry (Prunus campanulata); Japanese dogwood (Cornus kousa); bottlebush (Callistemon viminalis); and Florida torreyia (Torreya taxifolia). The Pasania is an attractive, rarely grown ever-green oak relative from Japan that deserves to be grown as a street tree in the southeast.

Koelreuteria. This research has been completed and published in the Journal of the Arnold Arboretum, vol. 57, #2, for 1976.

Identification of Ancient Plants at Pompeii and Herculaneum, Italy. Dr. Meyer, collaborator with Wilhelmina F. Jashemski, University of Maryland. A second trip (the trip of 1973 was previously reported) to these sites was conducted in July 1976, to complete the inventory of carbonized materials preserved by the eruption of Vesuvius in 79 A.D. Materials were seen in the National Museum in Naples, in the Deposito and Museum at Pompeii, and in various excavations of Dr. Jashemski. Material was examined and photographs made of the following carbonized materials: wheat, lentil, olive, walnut, fava bean, millet, chestnut, fig, bitter vetch, date, onion, almond, and pine nut. An inventory of existing carbonized materials will be published as evidence of the diversity of agricultural crop plants in Italy at the beginning of the Christian era.

Fuchs Project. Dr. Meyer, collaborator with Dr. Emily Trueblood and the Potomac Herb Society. A trip was made in July 1976, to obtain copies of original letters, title pages of books, and related bibliographical material of Leonhart Fuchs at the University of Tübingen and Stuttgart in Western Germany; in Paris, France; and in London, England. A facsimile volume is planned of "De Historia Stirpium" by Leonhart Fuchs, published in 1542, an herbal that ranks among the important landmark books in the history of botany. Materials obtained in 1976 will be incorporated into a separate volume of commentary to interpret the historical importance of this herbal.

Prunus (flowering cherries). R. M. Jefferson. In the 1920's, many Japanese cherry trees in Potomac Park were transplanted to various locations around Washington, D.C. -- the grounds of the U.S. Capitol, Library of Congress, Dalecarlia Water Treatment Plant, Ft. McNair, and the old Naval Hospital. In 1975, budwood from over 100 of these trees was collected and grafted at the National Arboretum. Forty-nine trees, from 4 ft. to 8 ft. tall, are now established in a nursery area as stock plants. Propagation from these will be offered as replacements for those now dying of old age in Potomac Park.

In response to a questionnaire, source locations for ornamental Prunus (cherry) taxa is now available from 172 institutions world-wide. The names of approximately 250 Prunus species, varieties, and cultivars reported in this study are being verified for nomenclatural accuracy. A detailed list of ornamental cherry sources will be published later.

A publication, "The Japanese Flowering Cherry Trees of Washington, D.C." by Roland M. Jefferson and Alan M. Fuson (National Arboretum Contribution No. 4), is now with the publisher and should be ready for distribution sometime this summer. This will be the first comprehensive publication on the subject, copiously illustrated with many photographs both black and white and color.

Malus (flowering crabapples). R. M. Jefferson. Crabapple budwood was obtained from 30 authenticated trees in the famous Arie den Boer Arboretum in Des Moines, Iowa. This material, now at the Plant Introduction Station, Glenn Dale, Maryland, will eventually be planted at the National Arboretum. Documentary information on 27 new ornamental crabapple cultivars was recorded for use in a projected new crabapple handbook.

Ilex (holly). T. R. Dudley and G. K. Eisenbeiss. Data input continues on Part II of the International Checklist of Cultivated Ilex. The work will establish the epithet priorities, correct spellings, and legitimize the nomenclature of the forms, varieties, cultivars, and botanical taxa of Ilex crenata. Data also is being accumulated for a separate publication on the cultivated taxa of I. aquifolium, I. x altaclarensis, I. cornuta, and other species of cultivated holly. A taxonomic and nomenclatural study, initiated several years ago, on the mistaken identity of Ilex ciliospinosa and I. centrochinensis, will be completed in 1977.

Viburnum. T. R. Dudley. Among the undetermined materials of the genus Viburnum received from several leading herbaria in this country and Europe, a number of taxa will be published as new to science, including six new species, ten new varieties, and two new forms from the People's Republic of China, and one new variety from Pakistan, and one from Turkey. Work has been started on the species of Viburnum and Ilex for the "Flora of Ecuador" which is published in Sweden.

Dwarf and Slow-Growing Conifers. In collaboration with Robert F. Doren. A "Finding Checklist", now in preparation, will be issued as a guide-handbook to the Gotelli Collection of conifers.

Staten Island, Argentina. T. R. Dudley. A long paper entitled "A Contribution to the Flora of Isla de los Estados (Staten Island), Tierra del Fuego, Argentina" has been submitted for publication in 1977. As the first botanical account of the island, the paper lists plant collections, ecological, phytogeographical, taxonomic, bibliographic, and locality information gathered on the expedition of 1971. A new white-flowered variety of Armeria was discovered on the expedition. A shorter version of the paper will be submitted for publication in Darwiniana, a journal published in Buenos Aires, Argentina.

Other Herbarium Research. In a recent (1976) paper, published in Castanea by Douglas Ogle of Abington, Virginia, and Peter Mazzeo, botanist at the National Arboretum, details are provided on the rediscovery of Betula uber from a remote area of southwestern Virginia in August of 1975. This rarest of American birches had been known only from the original collection made in 1914 and was thought to be extinct. As a result of the recent rediscovery, 15 trees and some seedlings are now known from a locality in Smyth County, Virginia. In the fall of 1976, seeds were collected of B. uber, and attempts will be made by the Arboretum to build up stock for distribution to other botanical gardens and arboreta throughout the country. For their good work in the rediscovery of the tree, Mr. Mazzeo and Mr. Ogle were co-recipients of the 1976 J. Shelton Horsley Research Award of the Virginia Academy of Science, for original research reported at the annual meeting of the academy. The rediscovery has had a number of press notices and a full write-up in the New Yorker, The Explorer, and American Forests magazines.

Herbarium. Over 60 visiting scientists used the herbarium from various universities and colleges in the United States, England, Argentina, Japan, Venezuela, France, Mexico, and the USSR. The herbarium grew by approximately 14,000 specimens, which brings the collection up to about 400,000 specimens. The major problem in the herbarium is always the need for more space to accommodate new acquisitions. In 1976, the acquisition of about 200 used herbarium cases from the Smithsonian Institution solved, beautifully, the space problem for the next few years, at least.

Field Trips. During the reporting period, over 2,000 specimens, representing over 650 collections, were collected as a result of field work, mainly in Southeastern United States. In April 1976, Mr. Gene Eisenbeiss and Dr. Dudley visited National Arboretum cooperating nurseries, private gardens, and other sites in Alabama, Mississippi, and extreme western Florida, under the auspices of the Southern Alabama Botanical and Horticultural Society. Various private gardens in the Mobile area were visited. In Mississippi, the Gloster Arboretum, founded by Mr. and Mrs. W. Frank Gladney (Mr. Gladney was a former member of our Advisory Council), was found to be a rich source of native plants and site of one of the largest collections of Magnolia species in the country. Of the wild plants, one locality in Walden County, Florida, was particularly exciting in that five native Ilex (holly) species were found growing together and in flower at the same time.

Statistical Report

3/31/74-6/30/75 - 7/1/75-12/31/76

Herbarium Material Received

Number of accessions of herbarium specimens received from other institutions and individuals.....	66	90
Number of specimens received as exchange.....	2,174	2,721
as purchase.....	777	1,290
as gift.....	<u>4,083</u>	<u>4,580</u>
Total number of specimens received.....	7,034	8,591

Herbarium Material Sent

Number of specimens sent as exchange.....	8,623	704
as gift.....	<u>80</u>	<u>88</u>
Total number sent.....	8,703	792

Materials have been sent to or received from more than 50 institutions in the following countries: Argentina, Australia, Chile, Egypt, France, Great Britain (England and Scotland), Italy, Japan, Korea, Portugal, Rhodesia, South Africa, Turkey, USD, and USSR.

Herbarium Material Borrowed (Loans)

Number of loans sent to other institutions.....	45	37
Number of specimens loaned.....	6,247	2,322
Number of loans from other institutions.....	29	12
Number of specimens borrowed from other institutions.....	6,692	295

Content of Herbarium

Number of specimens mounted and added to permanent collection:		
Regular material.....	6,604	6,486
Martindale Collection.....	<u>4,521</u>	<u>7,188</u>
Total.....	11,125	13,674
Number of herbarium specimens in permanent collection.....	389,025	402,699
Number of specimens collected by herbarium staff.....	c.6,000	ca.6,000
Number of specimens added to the type collection.....	384	131
Total number of specimens housed in the type collection, including clonotypes.....	1,482	1,613
Miscellaneous identifications of weeds and other material sent in via mail (all sources).....	384	459

Meetings, Travel, Lectures, etc.

T. R. Dudley: Holly Society of America meeting; National Arboretum Horticulture Workshop; South Alabama Botanical and Horticultural Society Symposium.

R. M. Jefferson: Instructor, Continuing Education for Women Center, George Washington University and National Arboretum Volunteer Guides; Executive Committee, D. C. Youth Gardens Program.

P. M. Mazzeo: Meeting of the Virginia Academy of Science and the Shenandoah National Park Research Symposium. Thirteen talks and lectures; four TV and radio shows; ten tours of the herbarium; a study trip (Harvard and New York Botanical Garden); judge for Regional Science Fair; Classification Committee for NCAFGC Flower Show; taught six classes for USDA Graduate School (Arboretum series); taught two classes for Smithsonian Associates.

F. G. Meyer: Five lectures; member of two committees (USDA Biological Control and Endangered Species).

B. Cytogenetics, Breeding, and Evaluation of Shade Trees

Betula. Work with this genus has broadened from the somewhat narrow goal of breeding and selecting better white-barked birches to a rather broad approach to understanding the taxonomy, genetics, and biochemistry of the principal species in the genus. The large number of mis-labeled and mis-identified specimens in arboreta and herbaria has led to great confusion regarding the landscape merits and breeding potential of some species.

Monarch Birch. A case in point is the monarch birch (B. maximowicziana). A recent article in the popular horticultural literature extolling the merits of this species prompted an absolute avalanche of orders at a major tree nursery. Our studies, in collaboration with Dr. Meyer, indicated that no true monarch birches were available from any American nursery and that most so-called monarch birches in arboreta were improperly identified. A paper has been prepared for publication in American Nurseryman to inform nurserymen of the current situation.

Japanese White Birch. The nomenclature and correct identification of true Japanese white birch (B. platyphylla var. japonica) is only slightly less confusing than monarch birch. In 1973, we established test plantings at "Shady Acres" that included seedlings from five known native sources of this species and several provenances of the major European and American white-barked birches. The superiority of the true Japanese species is clearly evident from growth and observation data taken in December 1976, and a seed orchard for continuous production of superior seed will be established with selected parents in 1977. An outstanding group of supposed Japanese white birch in the Arboretum (old nursery #5) has been tentatively identified as hybrids between the Japanese species and our American paper birch.

Biochemistry. Our study of phenolic compounds in the bark of birch species is almost complete. We have identified the compound rhododendrin in most birches and have determined the value of thin-layer chromatography (TLC) of bark phenolics for species identification and hybrid verification.

Hybridization. Past hybridization work has been sporadic over the last few years, largely because of problems of species identification. However, in 1977, we plan a rather extensive series of crosses with concentration on B. maximowicziana and B. luminifera.

Fraxinus. The major drawbacks to successful cultivation of native ash species are several borers. European and Asiatic ashes appear to suffer far less borer damage. In 1976, we initiated a hybridization program designed to test interspecific crossabilities and, in the long run, to test and select for borer resistance. Biochemical studies on leaf phenolics have shown that certain hybrid combinations can be

verified chemically, and there is a possibility that male and female seedlings of white and green ash can be "sexed" by chemical analysis.

Ilex. Plants of eight recently introduced cultivars of holly have been added to the permanent collection. Several seed collections of holly species collected from the wild in Korea were received in the fall of 1976 -- the first we have ever tried from this area. It is possible that some of this material may be tender under our conditions, especially during a winter like 1976-77. This past winter should enable us to make some important hardiness observations of all species and cultivars in our outdoor collection.

Four new Ilex selections were distributed for evaluation, and plans are underway for public release of male and female selections from I. serrata x verticillata.

Another insect on holly has recently been on the increase throughout the northern range of I. opaca. Fruits attacked by the holly berry midge do not ripen (turn red) in the fall. We will survey our collections to determine if there is any significant variation in resistance.

Magnolia. We were successful in crossing M. acuminata with two cultivars of M. x loebneri ('Merrill' and 'Spring Snow'), thus providing the genetic potential for yellow-flowered, multi-petaled trees that still bloom before leaf-bud break but after the most damaging late frosts. Our crossing work with M. acuminata has now been virtually completed and only the long haul (7-9 years) to flowering and evaluation remains.

Lack of success greeted our attempts to achieve any hybrids (from 100 crosses with 6 male parents) on selected trees of M. virginiana var. australis. Our goal in this work was to develop red- or pink-petaled trees that would bloom in May and June. In 1977, we will attempt similar crosses on M. virginiana var. virginiana.

Pinus. Our work on pine resin acids and white-pine weevil resistance was extended to some other species and hybrid combinations, with the results corroborating earlier hypotheses. As a result of our work, the U.S. Forest Service has initiated a large-scale chemical screening of P. strobus from known provenances to select trees that do not produce strobic acid and that could be used as parents in seed orchards designed to produce weevil-resistant progenies.

Quercus. Although the oaks are among our most valuable timber and landscape trees, relatively little breeding work has been done in this genus throughout the world. Oaks are known to hybridize extensively in the wild, but few attempts at artificial hybridization have been successful. With the aid of a grant from the Horticultural Research Institute, Dr. Santamour was able to visit Salt Lake City, Utah, to confer with Dr. Walter Cottan, a retired botany professor, who must be

considered the most successful oak hybridizer in the world. Dr. Santamour is cooperating with Dr. Cottam and Dr. John Tucker (U. Calif., Davis) in assembling data and verifying hybrids for future scientific and popular articles on this work.

Some of the first-generation hybrids appeared to have promise as first-class landscape trees, and some of the older hybrids were producing acorns in 1976. Vegetative propagation of oaks by cuttings is usually difficult, so that broad testing of the small number of first-generation hybrid oaks in any combination would not be easily accomplished. However, the second-generation hybrids, derived from open-pollination among the original hybrids, should give a wide range of variants for testing and selection.

Dr. Santamour set up a nation-wide evaluation scheme for these second-generation hybrids and distributed nearly 2,000 acorns from 30 seedlots to cooperators in Tennessee, Texas, Ohio, and California. This type of seed distribution will continue over the next few years at least, or until all potentially useful horticultural materials have been utilized. The Arboretum will also test progenies from less desirable crosses for genetic evaluation.

The most notable hybrids currently under test are those involving Q. turbinella, an evergreen, shrubby species of the dry Southwest. Hybrids of this species with Q. robur and Q. macrocarpa have performed exceptionally well in Salt Lake City, and should be quite drought resistant.

Rhododendron. All controlled pollinations (backcrosses second-generation, and others) have been completed in our attempts to utilize the yellow flavonol pigments of certain rhododendrons to impart yellow colors to evergreen azalea-like hybrids. Complete evaluation of these progenies should require about three years.

Publication of Symposium Proceedings. The Proceedings of the Symposium "Better Trees for Metropolitan Landscapes", held at the Arboretum in November 1975, was published late in 1976. Dr. Santamour was chief organizer and editor of the Symposium and the Proceedings and contributed two papers to the Proceedings. Other Arboretum scientists whose work appears in the Proceedings were Dr. Creech, Dr. Dudley, and Dr. Egolf. The Advisory Council was also well represented, with Chairman Flemer presenting a paper and Mr. Norweb serving on the Program Committee. This Symposium should serve as a landmark in the continuing work to develop superior trees for man's living and working environment.

METRIA Organized. The Metropolitan Tree Improvement Alliance (METRIA), which was both the parent and the child of the Symposium, was formally organized in August 1976. The first meeting was held in Lanham, Maryland. Dr. Santamour presented two papers at this meeting and was elected as Assistant Director of the Organization. He is also serving as Editor of these Proceedings, which should be published by June 1977.

Foreign Travel. In 1976, Dr. Santamour was invited to participate in a special pre-Congress meeting of IUFRO Working Party S2.05-02 "Genetic Resistance of Elms to Diseases and Insects" held in Wageningen, The Netherlands, June 16-19. At this meeting, Dr. Santamour presented a summary of his elm breeding research at the National Arboretum, which has produced more interspecific crosses and innovative approaches than any other project. Dr. Santamour was also able to observe the nurseries and test plots of the Dutch research program, and to select and obtain valuable new germ plasm. Following this meeting Dr. Santamour visited England for a first-hand look at the devastation caused by Dutch elm disease, and he obtained a rare disease-resistant elm species from Kew Gardens for use in his program.

Memorial Lecture. Dr. Santamour was selected to give the 13th annual Laura L. Barnes Memorial Lecture on April 20, 1976. This lecture is sponsored jointly by the Philadelphia Foundation and the Morris Arboretum and has included a number of international horticultural authorities among the chosen lecturers. Dr. Santamour spoke on "Better Trees for Metropolitan Landscapes", outlining the major points of the Symposium of the same name.

Meetings, Travel, Lectures, etc.

F. S. Santamour (in addition to those already noted): Northeastern Forest Pest Council, Boston, Mass., "Development of Pest-Resistant Trees", March 10, 1976; International Society of Arboriculture, St. Louis, Mo., "Selection and Breeding of Pest-Resistant Landscape Trees", August 9, 1976; and Swarthmore College, Associate's Day, Swarthmore, Pa., "The National Arboretum", October 10, 1976.

G. K. Eisenbeiss: Oregon Nurseryman's Short Course, Portland, Ore., (2 lectures), "New Plants from the National Arboretum" and "Holly Industry in the East", January 1975; and annual meetings, Holly Society of America, Louisville, Kentucky, November 1975 and Valley Forge, Pa., November 1976.

C. Cytogenetics, Breeding, and Evaluation of Ornamental Shrubs

The research facilities have been expanded and remodeled to provide for greater research efficiency. The three new 24' x 96' plastic greenhouses became operational although not fully complete. In these, the water main and overhead irrigation system were installed. Concrete walks and the work-room floor were installed in one unit. Until the gas heaters and air circulation system are installed, the greenhouses have been temporarily heated by kerosene space heaters. The permanent greenhouse, which could be only partially utilized last season due to rusted and broken pipes, has had new heat pipes installed. A 50-foot section of the propagation greenhouse with two benches and two 33-foot benches in the research greenhouse were equipped with a copper line and stainless steel nozzle automatic mist propagation system.

The shrub project has had several personnel changes during the year. Mrs. Janet Kovach, a University of Maryland conservation student, who worked as a student volunteer in the fall semester and as a Biological Aid in the spring semester on a WAE appointment during the academic year 1975-76, became a Biological Aid in November 1976. Mrs. Janet Walker and Mr. Kenneth Waters, horticulture seniors at the University of Maryland, joined the research staff as Biological Aids on WAE appointments for the academic year 1976-77. As a consequence of vacancies and thus lack of research staff continuity, research has of necessity had to be curtailed and realigned. However, with the excellent support of the staff, major shrub breeding achievements have been made.

Cercis. Since all seedling selections in 4 years have become infected with canker, there currently is no potential to develop resistant plants. Until genetic canker resistant germplasm can be isolated, further Cercis hybridization will be curtailed. Two of the darkest clear pink seedlings obtained from crosses have been selected for propagation.

Cotoneaster. The 560 fire blight resistant plants have been container grown, but have not fruited heavily.

Hamamelis. During the year, no additional crosses were initiated. The propagated stock plants have made good growth and are of sufficient size to provide for mass hybridization next season.

Hibiscus. The 71 triploid seedling selections have been evaluated another season, and six have been propagated for distribution to co-operators. All selections have profuse flowering throughout the summer and due to triploidy have little or no seed production. Within a few years colored cultivars will be available to extend the landscape adaptability of H. syriacus. H. syriacus 'Diana', the only introduced cultivar, has become the leading white cultivar and clearly demonstrates the potential for additional triploid cultivars.

Lagerstroemia. Mildew resistant clones have resulted from the hybridization of L. indica with such species as L. fauriei and L. subcostata. In 10 years the F_1 hybrids have developed into tree specimens with spectacular exfoliating bark that ranges from pale cream and light brown to dark cinnamon brown. During August, five of the evaluation sites - Gainesville, Florida; Semmes, Alabama; Houston, Texas; Renner, Texas; and Fayetteville, Arkansas - were visited for data recording. In particular, the Texas plantings were outstanding and have generated much enthusiasm among nurserymen, landscape architects, and gardeners for these diverse new hybrids. Two of the F_1 hybrids - one lavender with medium brown trunk, and the other white with dark cinnamon brown trunk - are being stock increased for introduction. A third selection - with coral flowers and light brown trunk - has been selected for propagation and distribution for stock increase. The 1975 hybridization emphasis was on plants of dwarf compact stature. From 132 crosses attempted, 106 produced seed that yielded 4,838 seedlings.

From the maturation of the 1972-1975 seedling populations of 48,381 plants, 1,562 selections have been made which will be space field planted this season. Many of these selections are F₂ and F₃ generations that exhibit more intense flower colors with a wide range of growth habits from dwarf to intermediate and tree types. The production of sterile triploid clones has been initiated by the treating of 64 species, cultivars, hybrid selections, and seedling populations with colchicine to produce 3,512 plants. These will be cytologically studied to locate tetraploid plants for hybridization with select diploids. Polyploid forms afford the potential to produce abundant flowering over a long season, as well as increased disease resistance and adaptable growth habits. An additional 12 species and cultivars have been added to the plant collection.

Malus. The fire blight resistant plants isolated by artificial inoculation of crosses, species, and cultivar seedling populations, have made good growth in the field. A few have flowered, but it will be several years before these can be critically evaluated. In addition to fire blight the plants are being evaluated for resistance to scab and mildew. The resistant plants with desirable ornamental characteristics will provide the germplasm for further crabapple hybridization. Nine additional species accessions have been procured for the germplasm collection.

Pyracantha. The development of fire blight and scab resistant cultivars continues to be the prime research objective. Twenty-one plants that combine the flower, fruit, and growth habit characteristics of three or four species have been selected in advanced generations. The severe cold stress conditions this season will provide a rigorous hardiness test. The 1,217 fire blight resistant seedlings selected by artificial inoculation from 33,128 plants grown in 1973-74 were field planted. However, these plants were not well established, and many have been killed or severely damaged during the winter. Two fire blight and scab resistant seedling selections - one, a 3-species hybrid with dense, low growth habit, dark evergreen foliage, and luminescent orange-red fruit that ripens late and persists throughout the winter; and the other with a narrow upright growth habit and yellow-orange fruit - have been distributed to cooperators for stock increase prior to introduction. In October the test sites at Puyallup, Washington, and New Brunswick, New Jersey, were visited. After evaluation of the cooperative test sites, a third late-ripening, orange-fruited plant with greater hardiness has been selected for propagation. More of the intergeneric hybrids have fruited, but none is of any significant ornamental merit. An F₂ population of 4,144 plants that represents 7 intergeneric combinations has been produced in an attempt to isolate genetic recombinants that might be landscape adaptable. From the screening of 7,168 dwarf seedlings grown in 1976, it is anticipated that genetic germplasm can be isolated for the development of more compact, heavy fruiting cultivars.

Syringa. An additional 183 accessions have been obtained for the research germplasm collection. The plants for the S. x hyacinthiflora

cultivar evaluation test have made excellent growth in the lath house beds and containers, and should be ready for field planting another season. The container-grown stock plants have developed into specimens with adequate flower inflorescences to permit extensive hybridization of S. x hyacinthiflora cultivars and mildew resistant and heat tolerant species. The earlier produced seedlings have been grown in the lath house and are of sufficient size for flowering this season. In late May and early June, the Syringa collections at Swarthmore College, Swarthmore, Pennsylvania, and Highland Park, Rochester, New York, were visited and propagation material collected for the research program.

Viburnum. The Viburnum collection has been repropagated to provide young, vigorous plants for the permanent display collection. The old stock plants have been removed and the area prepared for another nursery crop. Eight advance generation populations of dwarf and compact growth habit plants have been produced. In the evaluation tests several of the selections have been noteworthy and have created interest among nurserymen for their release. Three selections are being propagated, and adequate plants should be available next season for a stock increase distribution to cooperators.

Cooperative Evaluation and Stock Increase Program. The cooperative evaluation and stock increase programs have effectively expedited dissemination of National Arboretum introductions. In addition, these programs have become models to other research institutions and have been presented at four major meetings. At present, there are 94 co-operators, representing 38 nurseries, 17 arboreta and botanic gardens, 24 universities, and 15 miscellaneous, in the evaluation program; and 38 wholesale propagation nurseries in the stock increase program. The potential introductions are sent to 17 foreign locations for field evaluation and promotion.

The success of this program is dependent upon the cooperators. By far, the best cooperators are those with a special interest in the particular group of plants or are growers of such plants. The support of a cooperator is reflected by the evaluation report detail and numbers of plants propagated. Those who have provided limited support are deleted while additional active cooperators are recruited. The current emphasis is to provide a greater quantity of plants to fewer cooperators. For example, 50-500 plants of each of the two Pyracantha and two Lagerstroemia selections were distributed to stock increase cooperators. The cooperators' response in the next year to greater initial stock will delineate the maximum number of plants to be sent in future plant dispersals in order to promote greatest plant production in the shortest time interval.

Following is a summary of the cooperative evaluation and stock increase programs for 1976.

Cooperative Program - 1976

<u>Plant Material</u>	<u>No. Cooperators</u>	<u>No. Plants</u>
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Stock Increase:

<u>Camellia</u> N.A. 35868	12	135
<u>Ilex</u> N.A. 29738	3	60
<u>Lagerstroemia</u> N.A. 38448	16	2,160
<u>Lagerstoremia</u> N.A. 38449	16	2,710
<u>Pyracantha</u> N.A. 38450	18	2,810
<u>Pyracantha</u> N.A. 38451	19	4,210

Evaluation:

<u>Pyracantha</u> N.A. 38450	2	13
<u>Pyracantha</u> N.A. 38451	2	13
<u>Viburnum</u> N.A. 36800	2	13

Evaluation - Foreign:

<u>Lagerstroemia</u> N.A. 38448	6	28
<u>Lagerstoremia</u> N.A. 38449	6	28
<u>Pyracantha</u> N.A. 38450	10	56
<u>Pyracantha</u> N.A. 38451	8	48

Summary

	<u>Stock Increase</u>	<u>Evaluation</u>	
		<u>Domestic</u>	<u>Foreign</u>
No. Cooperators	25	2	12
No. Selections Represented	6	3	4
No. Plants Sent	12,085	39	160

Meetings, Travel, Lectures, etc.

D. R. Egolf (papers presented): "The National Arboretum Introduction Program for New and Improved Shrubs and Trees", November 6, 1975, Symposium, Better Trees for Metropolitan Landscapes, Washington, D.C.; "Lagerstroemia and Pyracantha Breeding at the U.S. National Arboretum", May 17, 1976, Bicentennial Symposium on Ornamental Plant Breeding, American Association of Botanical Gardens and Arboreta, Wilmington, Delaware; "Development and Introduction of Lagerstroemia and Pyracantha Cultivars", July 13, 1976, New Horizons Day, Horticultural Research Institute, Boston, Massachusetts; "Cultivar Introductions and Plant Introduction Program of the U.S. National Arboretum", October 19, 1976, Washington State Nurserymen's Association, Tacoma, Washington.

D. R. Egolf attended the following meetings: October 17-18, 1975, International Lilac Society, Rochester, New York; November 6, 1975, Symposium, Better Trees for Metropolitan Landscapes, U.S. National Arboretum, Wash., D.C.; March 23, 1976, National Capital Area Federation of Garden Clubs, U.S. National Arboretum, Wash., D.C.; May 12-13, 1976, National Council of State Garden Clubs, Pittsburgh, Pa.; May 16-17, 1976, American Association of Botanical Gardens and Arboreta, Wilmington, Delaware; May 20-24, 1976, International Lilac Society, Rochester, New York; July 13, 1976, New Horizons Day, Horticultural Research Institute, Boston, Mass.; July 29-August 4, 1976, evaluated test plantings of crape-myrtle and visited nurseries in the south (Gainesville, Fla.; Mobile, Ala.; Houston and Dallas, Texas; and Fayetteville, Ark.); October 16-22, 1976, International Lilac Society, Board Meeting, Amherst, Mass. and Washington State Nurserymen's Association, Tacoma, Wn. (visited test plantings and nurseries in Oregon and Washington); and November 4, 1976, Rutgers University, New Brunswick, New Jersey, to review Pyracantha test planting and take notes on selections.

D. Ornamental Introduction, Evaluation and Development

Camellia

Breeding for Floral Fragrance. 'Fragrant Pink Improved', a fertile cytochimera produced through the use of colchicine, has been used extensively in controlled crosses with species and cultivars possessing some floral fragrance. As a result, a series of promising hybrids bloomed for the first time during the 1976-77 season. Preliminary evidence appears to support the supposition that the gene mechanism determining floral fragrance in C. lutchuensis is different from that which determines the mild fragrance sometimes found in "cultivars" of C. japonica. And, that combining these genes in individual hybrids is possible.

Six F₂ scented hybrids have undergone stock increase and will be distributed for cooperator evaluation in 1978.

During the 1975-76 season 2,792 controlled crosses were made following objectives toward greater cold hardiness, floral fragrance and

new plant and flower forms resulting in 479 hybrid seedlings. With the 1976-77 season approximated 75 percent completed, 2,190 controlled crosses have been made with no estimate as yet regarding capsule development.

Extending the Range of Growing Camellias.

--Greater Cold Hardiness - Five interspecific hybrid crosses involving C. sasanqua, C. oleifera, C. hiemalis, and C. miyagii developed for greater cold hardiness potential have displayed flowers with commercial qualities. These are being propagated vegetatively for replicated cold-hardiness trials. The flowers of several of these are sasanqua-like, of good size and form, and have greater petal substance and a non-shattering habit.

--Greater Heat Tolerance - A number of interspecific hybrids involving C. hongkongensis or C. granthamiana as one parent have been developed, which may have potential in extending the range of camellias southward beyond their present boundaries. Of special interest is a hybrid 9-744 (C. hongkongensis x C. rusticana) which possesses the plant characteristics of C. hongkongensis and rose form double flowers of commercial quality.

--Intergeneric Hybridization - Immuno-suppressants were used in controlled crosses between Franklinia alatamaha and Camellia japonica during the summer seasons of 1975 (1,866 crosses) and 1976 (2,540 crosses). From the 1975 crosses, 18 seed capsules containing 444 seeds were harvested during the autumn of 1976. Average seed content per capsule (24.6 seeds) for controlled crosses was compared to open-pollinations (47.5 seeds). The reduction in seed content of the controlled crosses was as would be expected in intergeneric hybridization.

The harvested seeds were stratified on November 23 in an unheated greenhouse and then placed in a heated house on February 2, 1977, for germination. As of this writing (Feb. 7) no germination has taken place, but should within the next month.

Any hybrids which may develop from this intergeneric cross would be of considerable interest and have good commercial potential. Franklinia, itself, is hardy to Massachusetts and hybridized with Camellia should increase the cold hardiness of the latter, or the color and flower form range of the former.

Intergeneric crosses were also made in the greenhouse between C. sasanqua and Franklinia. One seed capsule containing one seed developed, was cultured, and germinated. The young plant has leaf characteristics typical of C. sasanqua, but of a diminutive size. Root tip examinations are as yet not conclusive but counts have been established between 45 and 49 chromosomes. This suggests that instead of an intergeneric hybrid, we have a haploid form of C. sasanqua. This would be possible if the Franklinia pollen had stimulated but not fertilized the ovary of the C. sasanqua parent causing it to produce an embryo from an unfertilized egg.

Anther and Meristem Culture. Anthers were cultured on a series of different media preparations during the spring of 1976, following preliminary experiments in the 1974-75 season. Success has been limited to the development of callus tissue, formation of chlorophyll, but subsequent death without development of either shoots or roots. Likewise, attempts at meristem culture have resulted in callus proliferation but a complete lack of shoot or root structures. It would appear that our nutrient media are lacking in some essential element for full development. This work will be continued in the coming year.

Iris kaempferi. Crosses were made during the summer of 1976 between the Japanese and the German iris. Pollen was gathered of German iris cultivars possessing either yellow or bright red flowers, since these are two colors lacking in the Japanese species. Immuno-suppressant, e Amino Capronic Acid was used in conjunction with all controlled crosses. Most of the crosses failed or produced abortive, non-viable seeds, but five seeds were cultured and germinated on nutrient agar. These young plants are still in culture bottles, and four out of five appear to have leaf characters intermediate between the species and are producing rhizomes similar to those expected of the German iris.

Efforts are underway to establish a rapid method of vegetatively propagating the Japanese iris. Some success has been achieved in culturing sectioned primordial flower spikes. This method when perfected will be important in the mass propagation of elite clones resulting from the iris breeding program.

Amaryllidaceae. The Lycoris project has been expanded to include a number of other members of the Amaryllidaceae group. The objective is to provide a broad base of operations for a Masters dissertation by Ms. M. Williams, now employed in the Ornamental Introduction and Development Program. The project will encompass interspecific and inter-generic hybridization, cytogenetic examination of parents and resulting hybrids, study of sterility barriers within the various sub-generic groups, induction of polyploid forms to overcome known sterile forms because of chromosome constitution, and establish cultural methods for the mass propagation of elite forms.

Malus. Approximately 100 trees of an elite selection of ornamental crab have been grafted and should be available in 1978 for distribution on the National Arboretum cooperative evaluation program.

Pyrus. A narrow columnar selection of Pyrus calleryana made in 1970 has been observed for commercial potentials since that time. This selection shows special promise for planting along narrow streets and in other restricted areas. Plans are being established for cooperator evaluation of this selection under other climatic conditions.

Rhododendron japonicum. A lack of field help coupled with high mortality rates among the F_3 generation have severely limited progress during the past two years. Hopefully, with the addition of new help this spring, the plantings may be returned to proper condition and some significant results may be salvaged from this project.

E. Plant Introduction Station, Glenn Dale, Maryland

The Plant Introduction Station at Glenn Dale, Maryland, is now a part of the National Arboretum. The 70-acre station is staffed with 12 research and 3 quarantine persons. Their primary responsibilities are to receive quarantined plant materials for the USDA which are imported from all countries of the world. Plants are observed for all types of pests including insects, fungi, bacteria, snails, and nematodes. They are tested, using several techniques, for a broad range of viroids, viruses, and mycoplasmas. Items found free of all pests are propagated and distributed to breeders throughout the United States. An average of 550 fruit, 1,900 ornamental, and 250 miscellaneous items were distributed to some 395 horticulturists, plant breeders, pathologists, biochemists, and agronomists during each of the past 5 years.

Another major activity at this Station involves detailed studies on viruses from fruit and woody ornamental plants. Viruses are extracted, purified, studied chemically and physically, and identified using host range, particle structure, and serology as the main criteria. During the past year, a virus disease of each of tomato, apples, cactus, geranium, and beans were studied in detail.

A new category of sub-microscopic infectious disease agent (mol. wt. 100,000) was discovered in 1976 by J. M. Kaper. In cooperative studies at Glenn Dale we now know that the multimillion dollar disease of tomatoes in France is caused by this agent, named CARNA-5. It exists only in the presence of cucumber mosaic virus. We have also learned that CARNA-5 exists in many places in the USA. We are in the process of determining if CARNA-5 is the cause of any hitherto unexplained death of tomatoes in the United States and whether it is responsible for any other diseases in vegetables and forage crops.

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U.S. DEPARTMENT OF AGRICULTURE PUBLICATIONS

The following Program Aids (PA) and Home and Garden Bulletins (HG) were written or revised by Erik A. Neumann.

- HG #120 - Growing Boxwood
- HG #192 - Transplanting Ornamental Trees and Shrubs
- HG #88 - Growing the Flowering Dogwood
- HG #117 - Trees for Shade and Beauty - Their Selection and Care
- HG #181 - Shrubs, Vines, and Trees for Summer Color
- HG #132 - Growing Magnolias
- PA #1158 - The National Bonsai Collection

